

- 1 1. A method for preparing a substrate for detecting at least one
2 analyte in a sample comprising the steps of:
 - 3 a) exposing the sample to at least two different selectivity
4 conditions, each selectivity condition defined by the combination of an adsorbent and an
5 eluant, to allow retention of the analyte by the adsorbent;
 - 6 b) identifying by desorption spectrometry at least one selectivity
7 condition under which the analyte is retained; and
 - 8 c) preparing a substrate comprising at least one adsorbent of an
9 identified selectivity condition.
- 1 2. The method of claim 1 wherein the step of identifying comprises
2 identifying at least one selectivity condition under which a plurality of analytes are
3 retained.
- 1 3. The method of claim 1 wherein the step of preparing comprises
2 preparing a substrate comprising a plurality of adsorbents that retain the analyte under an
3 elution condition as a multiplex adsorbent.
- 1 4. A method for progressively identifying a selectivity condition with
2 improved resolution for an analyte in a sample comprising the steps of:
 - 3 (a) identify a selectivity condition that retains an analyte in a
4 sample by:
 - 5 (i) exposing a sample to a set of selectivity conditions, each
6 selectivity condition defined by at least one binding characteristic and at least one elution
7 characteristic;
 - 8 (ii) detecting analyte retained under each selectivity
9 condition by desorption spectrometry; and
 - 10 (iii) identifying a selectivity condition that retains the
11 analyte; and
 - 12 (b) identifying a selectivity condition with improved resolution for
13 the analyte by:

(i) selecting at least one binding characteristic or elution characteristic from the identified selectivity condition and adding it to a selectivity characteristic constant set;

(ii) exposing the sample to a modified set of selectivity conditions wherein each selectivity condition in the modified set comprises (1) the selectivity characteristics in the constant set and (2) a binding characteristic or elution characteristic that is not in the constant set; and

(iii) identifying a selectivity condition from the modified set by desorption spectrometry that retains the analyte with improved resolution compared with a prior identified selectivity condition.

5. The method of claim 4 further comprising the step of repeating step (b) at least once.

6. The method of claim 5 comprising repeating step (b) until a selectivity condition is identified that retains only the target analyte from the sample.

7. A substrate for desorption spectrometry comprising an adsorbent from a selectivity condition identified to resolve an analyte by the method of claim 4

8. The substrate of claim 7 in the form of a kit further comprising an eluant from the selectivity condition or instructions on using the eluant in combination with the adsorbent

9. A method for determining whether an analyte is differentially present in a first and second biological sample comprising the steps of:

a) determining a first retention map for the analyte in the first sample for at least one selectivity condition:

b) determining a second retention map for the analyte in the second sample for the same selectivity condition; and

c) detecting a difference between the first and the second retention maps;

c) detecting a difference between the first and the second retention maps;

1 10. The method of claim 9 wherein the first biological sample derives
2 from a healthy subject and the second biological sample is from a subject suffering from
3 a pathological condition.

1 11. The method of claim 9 wherein the biological samples comprise
2 first and second cell extracts.

1 15. The method of claim 9 for determining whether an agent alters the
2 expression of a protein in a biological sample further comprising the step of
3 administering the agent to a first biological sample but not to a second biological sample.

1 16. The method of claim 10 wherein the sample is selected from the
2 group consisting of blood, urine, serum and tissue.

1 17. The method of claim 10 further comprising identifying an analyte
2 that is present in a greater amount in second biological sample than in the first biological
3 sample, whereby the analyte is identified as a candidate diagnostic marker for the
4 pathological condition.

1 18. The method of claim 11 wherein the first cell extract is derived
2 from a healthy cell and the second cell extract is derived from a cancer cell.

1 19. A method of diagnosing in a subject a disease characterized by at
2 least one diagnostic marker comprising the steps of:

3 a) providing a substrate for use in desorption spectrometry that
4 comprises at least one addressable location, each addressable location comprising an
5 adsorbent that resolves at least one of the diagnostic markers under an elution condition;

6 b) exposing the substrate to a biological sample from the subject
7 under the elution condition to allow retention of the diagnostic marker; and

8 c) detecting retained diagnostic marker by desorption spectrometry;
9 whereby detecting retained diagnostic marker provides a diagnosis
10 of the disease.

1 20. The method of claim 19 wherein diagnosis involves detection of a
2 plurality of diagnostic markers and the addressable locations comprise adsorbents that
3 resolve the plurality of diagnostic markers.

1 21. A kit for detecting an analyte in a sample comprising (1) a
2 substrate for use in desorption spectrometry that comprises at least one addressable
3 location, each addressable location comprising an adsorbent that resolves an analyte
4 under a selectivity condition comprising the adsorbent and an eluant, and (2) the eluant
5 or instructions for exposing the sample to the selectivity condition.

1 22. The kit of claim 21 for the diagnosis of a disease wherein the at
2 least one analyte is at least one diagnostic marker for the disease.

1 23. The kit of claim 22 wherein the disease characterized by a plurality
2 of diagnostic markers and the substrate comprises a plurality of addressable locations,
3 each addressable location comprising an adsorbent that resolves at least one of the
4 diagnostic markers.

1 24. The kit of claim 23 wherein at least one adsorbent is a multiplex
2 adsorbent comprising adsorbent species that each retain at least one diagnostic marker.

1 25. The kit of claim 23 wherein at least one adsorbent does not
2 comprise a biopolymer.

1 26. The kit of claim 23 wherein at least one addressable location
2 comprises a ligand specific for a diagnostic marker.

1 27. The kit of claim 26 wherein the ligand is an antibody.

1 28. A substrate for desorption spectrometry comprising at least one
2 adsorbent in at least one addressable location wherein the at least one adsorbent resolves
3 a plurality of diagnostic markers for a pathological condition from a patient sample.

1 29. The substrate of claim 28 wherein at least one adsorbent does not
2 comprise a biopolymer.

1 30. The substrate of claim 28 wherein one adsorbent resolves the
2 plurality of diagnostic markers.